

Michigan Department of Transportation (MDOT) Guide for Contract Time Determination (CTD) Procedures

DISCLAIMER: The following documentation is based upon the Federal Highway Administration's Guide for Construction Contract Time Determination Procedures (TA 5080.15 dated 10/15/02).

Purpose

To provide guidelines for determining contract time for construction projects.

FHWA Policy

Per 23 Code of Federal Regulations 635.121, The State Transportation Department (STD) should have adequate written procedures for the determination of contract time.

Introduction

Contract time is defined as the maximum time allowed in the contract for completion of all work contained in the contract documents. The determination of contract time affects not only the actual duration of the construction project, but also affects aspects of the construction process including cost, prospective bidders, and impacts to the traveling public and the local economy. The contract time is a major factor in how a contractor bids and determines their associated risk with the contract.

Contracts that specify too few working days or an unreasonably short contract time may:

- Increase bid prices
- Deter qualified bidders from bidding
- Potentially reduce quality of the work
- Increase contract overruns in cost and time
- Increase possibility of claims
- Increase administration, engineering, and inspection costs due to premium time
- Increase project management burden and contentiousness
- Decrease the chance of successfully completing the project within the contract time requirements

On the other hand, contract times that specify an excessive number of working days and are too long may:

- Inconvenience the traveling public with ongoing construction activities and work zone closures and/or extended detour time frames
- Allow contractors to stop work or minimize resources for extended periods causing a potential negative public perception of both the Department and the project
- Discourage industry innovation to complete projects in a more efficient and timely manner
- Increase administration, engineering, and inspection costs due to extended duration
- Affect road users by extended travel distance, additional travel time, and potentially a decrease in safety.

These are a few reasons why the validity of the contract time, and the method used to calculate contract time determination schedules, is extremely important and must be done consistently, reasonably, and accurately. The idea is that the contract time would represent the time in which an average, competent, appropriately staffed contractor would be able to complete the project. In establishing contract time, the Department should strive for the most efficient and shortest practical traffic interruptions to the road user (this does not necessarily mean the shortest project duration).

A good contract time determination schedule developed early in the design phase can not only be useful in developing the initial contract Progress Clause, but can also be passed along in the construction phase to aid in evaluating contractor schedules, determine personnel staffing, and making project management decisions.

General

Contract Time Determination (CTD) is the self-explanatory procedure for developing a schedule and determining a suitable contract time for construction contracts. The CTD process is useful regardless of the type of contract time administration, whether it be working days, calendars days, or calendar dates. An essential element of the CTD development process is to collaborate with an experienced team that includes designers, the project manager, construction and/or maintenance personnel, such that all aspects of sequencing, planning, and constructability are considered, as well as any special considerations for the project area such as festivals or other events that could influence the schedule.

In general, the CTD schedule should be developed in a way that:

- Allows the contractor sufficient time to complete the project
- Is based upon at least one reasonable and feasible solution
- Minimizes inconvenience to the traveling public and economic impacts to local communities
- Includes considerations to accelerated construction practices when applicable
- Utilizes any valuable information that has been developed in the planning of the engineers estimate (if applicable)
- Accounts for all known limitations of construction operations
- Considers any unusual circumstances that impact the time related aspects of the construction

The duration estimates produced should always be validated by individuals having experience in construction and who are knowledgeable of production rates, procurement times, construction means and methods, maintaining traffic, weather and seasonal impacts, and other factors that affect construction duration.

The CTD is typically finalized later in the design phase of the project after final quantities, staging, and maintaining traffic specifications are determined. However, contract time should be routinely considered, discussed, and updated at various milestone review meetings throughout the plan development process. A conceptual CTD including sequencing of activities can be prepared as early as 30% plans prior to determining final quantities. The finalized CTD should be reviewed by the different disciplines of design and construction staff for constructability and be placed and retained in the project files.

Steps for Developing a Contract Time Determination (CTD) Schedule

The following essential elements of scheduling are applicable for all methods used to determine contract time:

1. Identifying project scope and activities
2. Establishing applicable production rates
3. Computation of contract time

1. Identifying Project Scope and Activities

This step involves reviewing the plans, specifications, special provisions, and other items to obtain an understanding of the work and sequencing of construction. While the CTD schedule does not necessarily need to be as thorough as a contractor's construction schedule, enough detail should be provided to ensure all elements affecting construction time are considered.

The CTD schedule should follow the chronological sequence of work as outlined in the plans and proposal. Activities representing major tasks should be created for each stage of construction. Quantities for each construction activity need to be determined and may need to be broken down for each stage.

2. Establishing Applicable Production Rates

A production rate is defined as the quantity produced or constructed over a specified time period. Estimating realistic production rates is important when determining appropriate contract completion time. Production rates may vary considerably depending on a variety of factors which are noted below. The production rates used should be based on the desired level of resource commitment, labor and equipment, deemed practical given the physical limitations of the project. Due to the wide ranges of production rates and the resultant effect they can have on the schedule, considerable engineering judgment should go into selecting and adapting production rates for each specific project.

Factors Affecting Production Rates

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| • Location | • Soil conditions |
| • Regional weather limitations | • Quantities of work |
| • Access | • Previous work history |
| • Staging | • Materials and suppliers |
| • Traffic conditions | • Utilities/Railroads/third parties |
| • Complexity | • Working hours (daylight, noise ord.) |

3. Computation of Contract Time

A reasonable contract time for most construction projects can be determined by developing a CTD schedule. The duration of each activity included in the CTD schedule is computed from the item quantity and the applicable production rate. Once durations of each activity are complete, relationships and logic need to be assigned so the sequence of work operations is suitably represented and the critical path of the schedule is found. Start and end days (or dates) for each activity need to be based on the earliest day (or date) for which work on that item will begin and how long it will take to complete. The earliest start day (or date) for each activity will be

determined by the completion of preceding activities and should allow for the fact that some activities can begin before the preceding activity is entirely completed or done simultaneously in some instances. The critical path and controlling activities, can then be used to compute the reasonable amount of work days, calendar days, or dates that will allow for timely completion of the work.

Factors Affecting Contract Time

In addition to production rates, the following items must be considered when developing a contract time determination (CTD) schedule and computing contract time:

- Letting Date and potential 49-day period from letting until award of the contract. The actual start of construction may also not be able to occur for weeks after award due to any outstanding agreements, submittals, approvals, meetings, and mobilization.
- Effects of maintaining traffic requirements and stage changes on scheduling and the sequence of operations
- Curing time and waiting periods between successive paving courses or between concrete placement operations, as well as specified embankment settlement periods
- Time for testing operations (water, pressure, mandrel, welding, etc.) or videotaping operations (underdrain, storm sewer, etc.)
- Seasonal limitations for certain items when determining both the number of days the contractor will be able to work as well as the effect on production rates
- Conflicting operations and/or coordination with adjacent projects
- Time for reviewing and approving submittals like false-work plans, shop drawings, post-tensioning plans, mix designs, etc.
- Time for fabrication and procurement of structural steel, pre-cast concrete elements, and other long-lead items (refer to [Construction Manual Guidance](#))
- Coordination with utilities, railroads, third parties, etc.
- Non-work periods (Sundays, Holidays, special events, winter seasonal suspension, etc.)
 - Time to obtain necessary permits (environmental, FAA, etc.)
 - The effect of permitting conditions and/or restrictions
 - Restrictions for nighttime and weekend operations (local ordinances, noise, light, etc.)
 - Other items and consideration applicable to the specific project

Contract Time Determination Scheduling Methods

The following methods should be used to develop and compute contract time:

MDOT CTD Tool

The MDOT CTD Tool is applicable for use with projects in which there are relatively few major work components with easily understood relationships between all aspects of the project. The MDOT CTD Tool is advantageous because it is relatively simple and easy to understand, while offering a very reasonable method of determining contract time. However, it does have its limitations and is not recommended for large or complex construction projects.

Critical Path Method (CPM) Schedule

A CPM schedule can be an appropriate way to evaluate CTD for all projects, but especially recommended for large, high impact, or complex projects. These projects exhibit a reasonable potential for significant changes and uncertainty that may result in sequence modifications

and/or scope adjustments. A CPM schedule focuses on the relationship and logic of all the activities. Working from the project's beginning and defining individual project tasks and the number of days to perform each task, a logical diagrammatic representation of the project is developed. A CPM schedule depicts which tasks of a project will change the completion date if they are not completed on time. The evaluation of critical tasks allows for the determination of a reasonable and feasible contract time to complete projects. Due to the potential size and complexity of this method it is most often applied using a computer software program like Primavera P6 or Microsoft Project.

Advantages of using a CPM schedule include:

- It is an accurate technique for determining contract time and verifying that the project can be constructed as designed and with identified construction sequences
- A detailed CPM schedule will ensure that all activities are accounted for and can encapsulate all aspects of the project like sequential logic, construction stages, submittals, seasonal limitations, constraints, calendars, etc.
- The increased detail provides significantly more insight into how prospective bidders will have to approach the project, bid expectations, projects staffing and resources, and a general understanding of the project requirements

Disadvantages of using a CPM schedule include:

- It requires experienced and knowledgeable staff to be used effectively, therefore will have an increased level of effort (cost and time)
- It essentially requires specific computer scheduling software